

**PATENT COOPERATION TREATY**  
**PCT**

**INTERNATIONAL SEARCH REPORT**

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>WN/LM/ATMOS1</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 b below.	
International application No. <b>PCT/GB 00/ 02230</b>	International filing date ( <i>day/month/year</i> ) <b>08/06/2000</b>	(Earliest) Priority Date ( <i>day/month/year</i> ) <b>09/06/1999</b>
Applicant <b>ATMOSPHERIC SOLUTIONS LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :
  - contained in the international application in written form.
  - filed together with the international application in computer readable form.
  - furnished subsequently to this Authority in written form.
  - furnished subsequently to this Authority in computer readable form.
  - the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
  - the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished
- 2.  Certain claims were found unsearchable (See Box I).
- 3.  Unity of Invention is lacking (see Box II).
- 4. With regard to the title,
  - the text is approved as submitted by the applicant.
  - the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- the text is approved as submitted by the applicant.
- the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

- as suggested by the applicant.
- because the applicant failed to suggest a figure.
- because this figure better characterizes the invention.

 None of the figures.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/00/02230

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B01D53/66

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 529 937 A (COLT INT HOLDINGS ;COLT INT LICENSING (GB); MOLE ALAN (GB)) 3 March 1993 (1993-03-03) the whole document ---	1,19
X	US 4 808 396 A (SHIBANAI ICHIROH ET AL) 28 February 1989 (1989-02-28)  column 1, line 37-55; figures 1,3 column 3, line 35 -column 4, line 14 column 4, line 48-61 column 6, line 4-11 ---	2,5,6, 19-21, 23,24,28
X	US 5 256 377 A (NAKAMARU SUSUMU ET AL) 26 October 1993 (1993-10-26) column 5, line 24-26; figures 8,13 column 5, line 54-62 column 6, line 25-35 ---	1,19,21, 23,24
	-/-	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

8 September 2000

20/09/2000

Name and mailing address of the ISA

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Polesak, H

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02230

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>DATABASE WPI            Section Ch, Week 198546            Derwent Publications Ltd., London, GB;            Class E17, AN 1985-287057            XP002147017            &amp; JP 60 197222 A (MATSUSHITA ELEC IND CO LTD), 5 October 1985 (1985-10-05)            abstract</p> <p>----</p>	23
X	<p>DATABASE WPI            Section Ch, Week 199302            Derwent Publications Ltd., London, GB;            Class E36, AN 1993-012077            XP002147018            &amp; JP 04 338212 A (RICOH KK),            25 November 1992 (1992-11-25)            abstract</p> <p>-----</p>	1, 8, 24, 25

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

PCT/GB 00/02230

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP 0529937	A 03-03-1993	AT 132243 T AU 2119392 A DE 69207118 D DE 69207118 T ES 2081573 T ZA 9206356 A		15-01-1996 25-02-1993 08-02-1996 04-07-1996 01-03-1996 25-03-1993
US 4808396	A 28-02-1989	JP 1606191 C JP 2030729 B JP 63059338 A DE 3728802 A FR 2603272 A GB 2196959 A,B		31-05-1991 09-07-1990 15-03-1988 03-03-1988 04-03-1988 11-05-1988
US 5256377	A 26-10-1993	JP 1742141 C JP 4033496 B JP 63270547 A JP 1058326 A JP 2605055 B CA 1331689 A DE 3814603 A FR 2614553 A GB 2210607 A,B		15-03-1993 03-06-1992 08-11-1988 06-03-1989 30-04-1997 30-08-1994 10-11-1988 04-11-1988 14-06-1989
JP 60197222	A 05-10-1985	JP 1625354 C JP 2050766 B		18-11-1991 05-11-1990
JP 4338212	A 25-11-1992	NONE		

## PATENT COOPERATION TREATY

PCT

REC'D 17 AUG 2001  
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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference WN/NV/ATMOS.PCT	<b>FOR FURTHER ACTION</b>		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB00/02230	International filing date (day/month/year) 08/06/2000	Priority date (day/month/year) 09/06/1999	
International Patent Classification (IPC) or national classification and IPC B01D53/66			
Applicant ATMOSPHERIC SOLUTIONS LIMITED et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I     Basis of the report
- II     Priority
- III     Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV     Lack of unity of invention
- V     Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI     Certain documents cited
- VII     Certain defects in the international application
- VIII     Certain observations on the international application

Date of submission of the demand 06/10/2000	Date of completion of this report 14.08.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Polesak, H  Telephone No. +49 89 2399 8628



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB00/02230

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):  
**Description, pages:**

1-17                   as originally filed

**Claims, No.:**

1-30                   as originally filed

**Drawings, sheets:**

1/6-6/6               as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description,       pages:
- the claims,              Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02230

- the drawings,      sheets:
5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*
6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims
	No:	Claims 1,23,24
Inventive step (IS)	Yes:	Claims
	No:	Claims 1-30
Industrial applicability (IA)	Yes:	Claims 1-30
	No:	Claims

### 2. Citations and explanations see separate sheet

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
see separate sheet

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
see separate sheet

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB00/02230

**Point V**

- (1) EP-A-0 529 937
- (2) US-A-4 808 396
- (3) US-A-5 256 377
- (4) DATABASE WPI Section Ch, Week 198546 Derwent Publications Ltd.,  
London, GB; Class E17, AN 1985-287057 of JP-A-60 197222
- (5) DATABASE WPI Section Ch, Week 199302 Derwent Publications Ltd.,  
London, GB; Class E36, AN 1993-012077 of JP-A-04 338212

1. Independent claims 1 and 24 lack novelty under PCT Article 33(2) as being anticipated by each of the documents (1), (2), (3) or (5). These references disclose a method of reducing the level of ozone by releasing vapour from a terpenoid or a mixture of terpenoids into the environment at a controlled rate and an apparatus for removing ozone comprising an emission element of absorbent material impregnated with at least one terpenoid compound located within a container which in use allows free circulation of vapour into said environment. Independent claim 23 lacks novelty under PCT Article 33(2) as being anticipated by each of the documents (2), (3) or (4). These references disclose use of particular terpenoid compounds for the removal of ozone in an enclosed environment. Further, no surprising features, whose inception would have involved the exercise of some inventive skill, appear to be present in the dependent claims.

**Point VII**

1. Metric units must be employed everywhere. The unit "micron(s)" does not meet the requirements of Rule 10.1 (a) PCT. The "micron(s)" should be replaced by  $\mu\text{m}$ .
2. The description should include a proper acknowledgement of the prior art ; Rule 5.1(a)(ii) PCT.

**Point VIII**

1. It is not clear whether claim 12 is to be regarded as dependent on claims 9 or 11 or is an independent claim, as claims 1 to 10 do not contain the feature "particles".

*NIC*

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
14 December 2000 (14.12.2000)

PCT

(10) International Publication Number  
**WO 00/74820 A1**

- (51) International Patent Classification<sup>7</sup>: **B01D 53/66**
- (21) International Application Number: **PCT/GB00/02230**
- (22) International Filing Date: 8 June 2000 (08.06.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
9913357.1 9 June 1999 (09.06.1999) GB
- (71) Applicant (for all designated States except US): **ATMOSPHERIC SOLUTIONS LIMITED [GB/GB]**; Unit 23Y, Bond's Mill Estate, Bristol Road, Stonehouse, Gloucestershire GL10 3RF (GB).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **MAXWELL, Stuart [GB/GB]**; 23 Granville Street, Cheltenham, Gloucestershire GL50 4BL (GB). **SENNETT, Mervyn, Napoleon [GB/GB]**; Alfriston, 105 Elvetham Road, Fleet, Hampshire GU13 8HN (GB). **MOULTON, Jonathan, Paul [GB/GB]**; 57 Kippington Road, Sevenoaks, Kent, TN13 2LL (GB).
- (74) Agents: **NEWELL, William, Joseph et al.; Wynne-Jones, Lainé & James**, 22 Rodney Road, Cheltenham, Gloucestershire GL50 1JJ (GB).
- (81) Designated States (national): AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A1

**WO 00/74820**

(54) Title: REDUCTION OF OZONE IN AN ENCLOSED ENVIRONMENT

(57) Abstract: In an enclosed environment subject to increased levels of ozone caused, for example by electrostatic equipment such as laser printers and photocopiers, the levels of ozone are reduced by releasing vapour from a terpenoid or a mixture of terpenoids into the environment at a controlled rate. In one aspect the vapour is released from an emission element of absorbent material impregnated with the or each terpenoid compound and located within a container which in use allows free circulation into the environment. The absorbent/emission characteristics of the absorbent material are selected to provide an extended release of the terpenoid or terpenoids into the environment.

Reduction of Ozone in an Enclosed Environment

This invention relates to the reduction of ozone in an enclosed environment.

The rising number of asthma sufferers in the Western World and in particular in the United Kingdom is a matter of great concern and much research has been done to understand both the causes of the disease and the mechanisms which trigger the onset of an attack.

It is known from published papers by RB Devlin et al ("Health Effects of Ozone", Science and Medicine, May/June 1997, pages 8 to 17) and by N A Molfino et al ("Effect of Low Concentrations of Ozone on Inhaled Allergen Responses in Asthmatic Subjects", The Lancet, Volume 338, No. 8761, 27 July 1991, pages 199 to 203) that relatively low levels of ozone, similar to those commonly occurring in urban areas, can increase the likelihood of asthma attacks.

Ozone occurs naturally and can for example be caused by thunder storms. Ozone is also created by ultraviolet light. Further, in an office environment levels of ozone can rise significantly due to the ozone produced by electrostatic printing equipment such as laser printers and photocopiers.

The problem of reducing the level of ozone produced by apparatus such as a photocopier or laser printer has been

addressed in US 4,853,735. It has been recognised that such devices are a principle source of ozone in an office environment and thus this document attempts to deal with the problem by reducing the level of ozone near the source 5 i.e. within the apparatus. In order to achieve this a volatile ozone removing agent comprising a mixture of a terpenoid and a glycol family material is used. An ozone removing device is located within the photocopier machine and is designed to provide a controlled flow rate of ozone 10 removing agent. With this arrangement, there are several disadvantages. Firstly the location of the ozone removing agent within the confines of the photocopier means that it will be subject to temperature ranges well outside the normal range of room temperatures and so the evaporation 15 rates will vary accordingly. Another difficulty is that the ozone removing device is a fixture to the photocopier and so will tend to be regarded as a replaceable item for the photocopier, which will require installation, and the device will be priced accordingly. Furthermore, the device 20 requires the use of glycol which is a corrosive material. In addition, ozone is a naturally unstable compound and so, outside working hours, the ozone levels in a room will fall to a baseline level, and thus any evaporation of ozone reducing agent outside working hours is effectively wasted.

US Patent 5,567,416 discloses a slow-volatizing terpenoid composition comprising a mixture of a terpenoid and an anti-oxidant absorbed into a polymeric network material. There are several difficulties associated with this proposal; the substance involved has a relatively low boiling point and uses an additive to raise the flash point of the composition. The additive is dichloropentafluoropropane (HCFC225) which is thought by some to be environmentally undesirable. Furthermore the composition includes an anti-oxidant which is intended to prevent oxidation of the limonene. Since ozone is a powerful oxidizing agent, it is believed that this anti-oxidant may inhibit the reaction of the terpene with ozone.

US Patent 5,256,377 describes an ozone removing device which again is primarily for use in photocopiers. A terpenoid is absorbed onto a support material and subjected to forced ventilation by means of a fan at the outlet of a photocopier.

Japanese Patent Documents JP 1310366, JP 2090184 and JP 62155927 each disclose arrangements in which an ozone removing device is located in or adjacent the exhaust duct of a photocopier.

Accordingly, it is an aim of this invention to provide a passive method and apparatus for controlling the level of

ozone in a room or other generally enclosed environment which does not rely on heating or forced ventilation and furthermore which provides a controlled release of ozone reducing agent at a rate commensurate with maintaining the 5 ozone levels in a room housing a photocopier and/or a laser printer at acceptable levels, without requiring the use of potentially harmful additives, so as to make effective use of the ozone reducing agent to provide an extended ozone-reducing effect.

10 Accordingly, in one aspect, this invention provides a method of reducing the level of ozone in a generally enclosed environment, which comprises releasing vapour from a terpenoid or a mixture of terpenoids into the environment at a controlled rate.

15 In studies conducted by the Applicants it has been found that a useful control effect is achieved by releasing the terpenoid vapour at a rate of between 40 and 120mg per hour, more preferably between 60 and 100mg per hour, and ideally about 80mg per hour. The Applicants have 20 determined that a room may be dosed with terpenoid compounds at a required given evaporation rate by careful balancing of the emission characteristics of the support (e.g. void volume, pore size, particulate size etc.) with the evaporation characteristics of the terpenoid compound

(determined by, e.g. the boiling point temperature) and the amount of terpenoid to be stored. Thus in one preferred example linalool is impregnated into an emission element of Vyon E grade material, and, for the size of emission element used an emission rate of about 80 mg/hour is achieved. More volatile compounds (i.e. with lower boiling points) would need to be used with a less emissive material.

It is preferred for said terpenoid vapour to be released by evaporation from an emission element of absorbent material. The evaporation preferably takes place at normal room temperature ( $17^0\text{ C}$  to  $25^0\text{ C}$ ) (i.e. no heating is required), such that the evaporation rate, and thus working life of the emission element can be predicted. Likewise evaporation and permeation of the vapour throughout the generally enclosed environment preferably occurs in natural, unforced ventilation (i.e. no fan or confining duct is used).

Preferably said emission element is located in a container configurable between an open position, in which the element is exposed to the ambient atmosphere and a closed position in which said element is generally enclosed within a housing.

Preferably the emission element comprises a porous synthetic polymer structure. The polymer lattice may conveniently be produced by moulding and/or sintering a starting material comprising a synthetic thermo-plastic polymer in particulate form.

In one embodiment, the starting material is a high density polyethylene in which at least 80% by weight of the particles have a particle size within the range of from 1 to 500 micron.

Naturally the size and weight of the emission element depend at least partly on the size of the room to be treated, the volatility of the absorbed liquid and the porosity of the element. In one example said emission element, before absorption of said terpenoid, may typically weigh from 5 to 15 grams. The emission element preferably contains between 10 and 20 grams of terpenoid liquid, and ideally about 15 grams thereof.

The void volume of the emission element may conveniently lie in the range of from 25% to 70% and more preferably between 30% and 55%. In a particular example, the average pore size of the emission element is between 10 and 100 microns.

Preferably the or each terpenoid comprises a terpene or a carotenoid. At least one of the terpenoid compounds

preferably comprises a compound extracted from a plant, or a synthesised compound corresponding to a constituent of a plant extract. Plant extracts that we have found to be suitable are lavender oil, orange oil, grapefruit oil, lime oil, myrtle oil, coriander oil, tea tree oil, elecampane oil, juniper oil, dill oil, lemon oil, elemi oil, spanish sage oil, cypress oil, pine needle oil, lemon balm (melissa) oil, nutmeg oil, ylang ylang oil, basil oil, grapeseed oil, whilst suitable natural or synthesised compounds comprise  $\alpha$  phellandrene,  $\alpha$  humulene,  $\alpha$  terpinene, limonene,  $\alpha$  pinene,  $\beta$  caryophyllene, linalool, linalyl acetate, and myrcene.

To enhance safety without requiring the use of modifiers etc., the flash point of the terpenoid compound 15 is preferably greater than 60° C.

Of the compounds set out above we have found linalool to be particularly effective in terms of reaction with ozone and a sustained evaporation rate.

In another aspect, this invention provides the use of 20 at least one of lavender oil, orange oil, grapefruit oil, lime oil, myrtle oil, coriander oil, tea tree oil, elecampane oil, juniper oil, dill oil, lemon oil, elemi oil, spanish sage oil, cypress oil, pine needle oil, lemon balm (melissa) oil, nutmeg oil, ylang ylang oil, basil oil,

grapeseed oil,  $\alpha$  phellandrine,  $\alpha$  humulene,  $\alpha$  terpinene, limonene,  $\alpha$  pinene,  $\beta$  caryophyllene, linalool, linalyl acetate, or myrcene for the removal of ozone in a generally enclosed environment.

5       In another aspect, this invention provides apparatus for removing ozone in a generally enclosed environment, said apparatus comprising an emission element of absorbent material impregnated with at least one terpenoid compound located within a container which in use allows free  
10      circulation of vapour into said environment.

Preferably said container is reconfigurable between an open operational configuration, in which vapour evaporating from said emission element may dissipate into said environment, and a closed configuration in which said  
15      emission element is enclosed.

Advantageously, said container comprises an inner housing having perforate walls, said inner housing being movably mounted with respect to an outer housing. Preferably said emission element comprises a porous polymer substrate impregnated with a terpenoid compound. Said terpenoid compound may advantageously comprise linalool, preferably without additives. Preferably said emission element contains between 10 and 20 grams of linalool. Preferably said emission element has a void volume of  
20

between 25% and 70% and an average pore size of between 10 and 100 microns.

Whilst the invention has been described above it extends to any inventive combination of the features set 5 out above or in the following description.

The invention may be performed in various ways, and an embodiment thereof and certain test results will now be described in detail, reference being made to the accompanying drawings, in which:-

10 Figure 1 is a front plan view of an ozone removing apparatus in accordance with the invention, in an open position;

Figure 2 is a side view, taken on the left hand side of the apparatus of Figure 1;

15 Figure 3 is a graph showing the decay of the concentration of ozone in a closed environment (i) naturally and (ii) when an ozone reducing device in accordance with this invention is present, and

20 Figure 4(a) to 4(d) are comparative graphs showing the build up of ozone in a closed environment containing an ozone generator (i) with natural decay only (ii) with a first example of this invention and (iii) with a second example of this invention, after 72, 96, 120 and 168 hours respectively.

Referring to Figures 1 and 2, a dispenser comprises a perforated housing 10 containing an emission disk or element 12 made of a sheet of an absorbent porous polymer lattice structure available under the Trade Name Vyon Grade E from Porvair Limited, Norfolk, UK. The disk was approximately 90mm in diameter, 5mm thick, and weighed approximately 10 grams. The emission element 12 was left to stand in a dish of a terpenoid (in this example linalool) until saturated. The emission element took up about 15 grams of linalool. The porosity of the support was selected having regard to the volatility of the linalool so that, under normal room temperature conditions, with natural ventilation, the emission element emitted about 80mg of linalool per hour. This gave a theoretical maximum life of 187.5 hours which is equivalent to approximately one month of working hours in a typical office room containing a photocopier.

The perforated housing 10 is pivotally mounted within an outer, imperforate housing 14 having a pivotal attachment, so that the apparatus can be moved between an open position (as shown in Figure 1) and a closed position in which the container is enclosed substantially wholly within the housing 14 thus preventing release of the linalool.

Referring now to Figure 3, this is a graph showing the natural decay rate of ozone and the decay rate with a product in accordance with the invention. In this instance the product included a rectangular emission element of Vyon F material, of 90mm x 70mm and 4.75mm thickness, impregnated with about 15 grams of linalool. It will be seen that the time taken for the ozone concentration to reduce naturally to 50 ppb is over 1000 seconds, whereas with the example of the invention the ozone concentration reduces to 50 ppb in about 260 seconds.

Referring now to Figures 4a to 4d, these are graphs showing the ozone concentration or build up in a closed test environment when an ozone generator is turned on. On each graph there are three traces; the ozone concentration without any ozone removing agent, and the ozone concentration with two examples of the invention (Vyon E#1 and Vyon E#2). In addition to this, the sequence of Figures 4(a) to 4(d) show the characteristics of two examples of the invention after 72, 96, 120 and 168 hours respectively. The examples of the invention comprised Vyon E grade disks 90mm in diameter and 4.75 mm thick, with an original impregnation of about 15gms of linalool. These graphs show individually that the examples of the invention maintain the ozone concentration at a peak level of below

about 75 ppb and generally at about 50 ppb or lower, whereas without the ozone-removing devices the ozone concentration would reach over 200 ppb. The graphs as a set show that the examples of the invention retain their ozone-removing effect substantially unchanged for at least 168 hours. Assuming that the devices are closed outside working hours and that there is no significant evaporation when closed, this means that the examples will continue to be highly effective for at least 21 working days.

As noted above the apparatus emits linalool vapour at a rate of about 80mg per hour, (when the device is open). This emission rate is substantially constant over the life of the pad. Our studies have shown that, in a typical office environment including a photocopier and a laser jet, about 10mg of ozone may be produced per hour. Given the relative molecular weights of linalool and ozone, 32mg of linalool per hour would be required, assuming that each molecule of linalool reacted with an ozone molecule. In practice an excess of linalool is required and for this purpose a factor of between 2 and 3 has been found to work reasonably well. Accordingly it has been found that an evaporation rate of linalool of between 60 to 100mg per hour provides good performance.

These emission rates, together with the sustained extended emission life achieved through careful matching of the properties of the oil with the emission element, provide a particularly effective solution to the problem of maintaining low ozone levels in an office environment. Furthermore, the active agent in the material can be derived from natural sources or be a synthetic derivation thereof, and so is environmentally friendly without requiring additives, which may themselves be seen as environmentally unfriendly, or other substances which may add to the material or manufacturing cost of the device.

Whilst the above embodiment uses linalool on a absorbent pad of Vyon E material, it will of course be appreciated that other terpenoids may be used with other emission elements.

The tables below illustrate the terpenoid compounds which have been tested for their effectiveness in carrying out the present invention. In Table 1, the compounds are shown ranked in order of reactivity, showing the time taken to reduce the concentration of ozone in a standard test atmosphere (100ppb ozone) to 50% of the standard concentration (t100-50) and to 20% of the standard concentration (t100-20).

The tests were carried out with a grade of Vyon material which emitted at a higher rate than Vyon 'E', initially impregnated with 5ml of linalool, but the results are a good illustration of the relative performance of the  
5 substances.

TABLE 1

Essential Oil and Chemical Reactivity

Essential Oil/Chemical	t100-50 (sec)	t100-20 (sec)
Tangerine	112	226
Myrcene	122	261
Mandarin	122	280
Limonene	131	292
Fir needle	132	336
Melissa	163	407
Carrot seed	169	404
Linalool	185	387
Bay	195	526
Dill seed	195	587
Myrtle	200	506
Fennel	201	449
Ravensara	239	567
May Chang	250	524
Inula	260	544
Petitgrain	265	647
Cajeput	276	723
$\beta$ -pinene	288	653
Coriander	292	571
Manuka	320	756
Clary Sage	320	714
Ho Wood	325	866
Eucalyptus	328	664
Spcarmint	329	776
Citronella	330	>1000
$\beta$ -Caryophyllene	344	645

TABLE 1 (cont.1)

Sage	350	>1000
Peppermint	352	730
Ginger	354	814
Niaouli	359	741
Linalyl acetate	375	736
Myrrh	384	839
Palmarosa	388	892
Spanish sage	392	>1000
Thyme	392	>1000
Geraniol	399	>1000
Valerian	407	785
Cardamon	409	992
Oregano	423	954
Patchouli	460	>1000
Friars Balsam	468	>1000
Terpineol	474	
Nerol	486	>1000
Cinnamon	503	>1000
Citronellol	530	>1000
Ylang Ylang Extra	531	>1000
Geranium	538	>1000
Ylang Ylang	539	>1000
Cedar Wood	539	>1000
Jasmine	584	>1000
Amyris	628	>1000
Citral	647	>1000
Soya	667	>1000
Farnesol	669	>1000
Coconut	673	>1000
Hop Oil	688	>1000

TABLE 1 (cont. 2)

Oleic acid	688	>1000
Carrot tissue	691	>1000
Almond Oil	731	>1000
Clove bud	738	>1000
Hypericum	741	>1000
Hop Extract	742	>1000
Calendula	749	>1000
Borage	768	>1000
Sunflower	771	>1000
Apricot Kernel	784	>1000
Roschip	796	>1000
Grape Seed	808	>1000
Evening Primrose	813	>1000
Clove Stem	827	>1000
Peach Kernel	831	>1000
Rapeseed	841	>1000
Teak	844	>1000
Jojoba	915	>1000
4-allyl anisole	925	>1000
Vetiver	934	>1000
Wheatgerm	943	>1000
Avocado	1002	>1000

CLAIMS

1. A method of reducing the level of ozone in a generally enclosed environment, which comprises releasing vapour from a terpenoid or a mixture of terpenoids into the environment at a controlled rate.

2. A method according to Claim 1, which comprises releasing the terpenoid vapour at a rate of between 40 and 120mg per hour.

3. A method according to Claim 1 or Claim 2, which comprises releasing the terpenoid vapour at a rate of between 60 and 100mg per hour.

4. A method according to any of the preceding Claims, which comprises releasing the terpenoid vapour at a rate of about 80mg per hour.

5. A method according to any of the preceding claims, wherein said terpenoid vapour is released by evaporation from an emission element.

6. A method according to Claim 5 wherein said terpenoid vapour is released by evaporation from an emission element at normal room temperature ( $17^0\text{ C}$  to  $25^0\text{ C}$ ).

7. A method according to Claim 5 or 6 wherein said emission element is exposed to natural, unforced ventilation.

8. A method according to any of Claims 5 to 7 wherein said emission element is located in a container configurable between an open position, in which the element is exposed to the ambient atmosphere and a closed position in which said element is generally enclosed within a housing.

9. A method according to any of claims 5 to 8 wherein said emission element is a porous synthetic polymer element.

10. 10. A method according to Claim 8 wherein said synthetic polymer element is produced by moulding and/or sintering a starting material comprising a synthetic thermo-plastic polymer in particulate form.

11. A method according to Claim 10 wherein the starting material is a high density polyethylene.

12. A method according to Claim 9 or Claim 10, in which at least 80% by weight of the particles have a particle size within the range of from 1 to 500 micron.

13. A method according to any of Claims 5 to 12, wherein said emission element, before absorption of said terpenoid, weighs from 5 to 15 grams.

14. A method according to Claim 13 wherein the emission element contains between 10 and 20 grams of terpenoid liquid.

15. A method according to Claim 13, wherein the emission element contains about 15 grams of terpenoid liquid.

16. A method according to any of Claims 5 to 15 wherein the void volume of the emission element is in the range of  
5 from 25% to 70% of the volume of the emission element.

17. A method according to Claim 16, wherein the void volume of the emission element is between 30% and 55%.

18. A method according to any of the preceding Claims wherein the average pore size of the emission element is  
10 between 10 and 100 microns.

19. A method according to any of the preceding Claims wherein the or each terpenoid comprises a terpene or a carotenoid.

20. A method as claimed in any of the preceding Claims,  
15 wherein the terpenoid, or at least one of the terpenoids comprises an essential oil.

21. A method according to any of the preceding claims, wherein the terpenoid compounds or mixture thereof is selected from the group comprising lavender oil, orange oil, grapefruit oil, lime oil, myrtle oil, coriander oil, tea tree oil, elecampane oil, juniper oil, dill oil, lemon oil, elemi oil, spanish sage oil, cypress oil, pine needle oil, lemon balm (melissa) oil, nutmeg oil, ylang ylang oil, basil oil, grapeseed oil,  $\alpha$  phellandrene,  $\alpha$  humulene,  $\alpha$

terpinene, limonene,  $\alpha$  pinene,  $\beta$  caryophyllene, linalool, linalyl acetate.

22. A method according to any of the preceding Claims, wherein the flash point of the or each terpenoid is at least 60°C .

23. Use of at least one of lavender oil, orange oil, grapefruit oil, lime oil, myrtle oil, coriander oil, tea tree oil, elecampane oil, juniper oil, dill oil, lemon oil, elemi oil, spanish sage oil, cypress oil, pine needle oil, 10 lemon balm (melissa) oil, nutmeg oil, ylang ylang oil, basil oil, grapeseed oil,  $\alpha$  phellandrine,  $\alpha$  humulene,  $\alpha$  terpinene, limonene,  $\alpha$  pinene,  $\beta$  caryophyllene, linalool, linalyl acetate, or myrcene for the removal of ozone in a generally enclosed environment.

15 24. Apparatus for removing ozone in a generally enclosed environment, said apparatus comprising an emission element of absorbent material impregnated with at least one terpenoid compound located within a container which in use allows free circulation of vapour into said environment.

. 20 25. Apparatus according to Claim 24, wherein said container is reconfigurable between an open operational configuration, in which vapour evaporating from said emission element may dissipate into said environment, and a

closed configuration in which said emission element is enclosed.

26. Apparatus according to Claim 24 or Claim 25, wherein said container comprises an inner housing having perforate walls, said inner housing being movably mounted with respect to an outer housing.

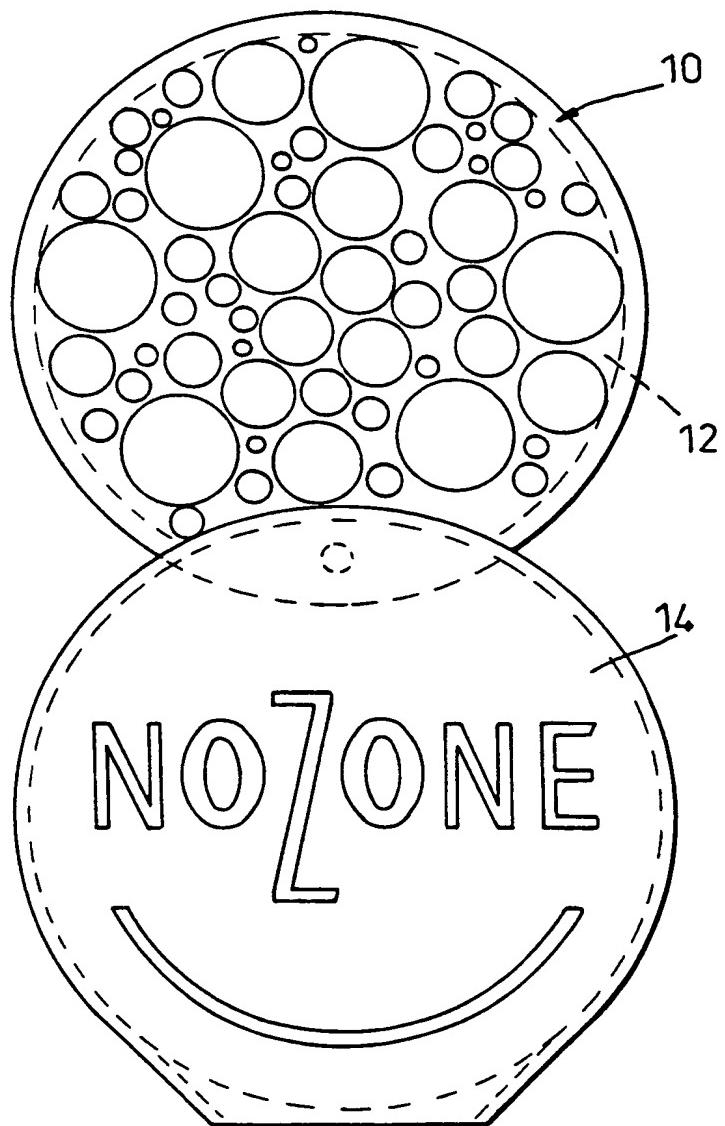
27. Apparatus according to any of Claims 24 to 26, wherein said emission element comprises a porous polymer substrate impregnated with said terpenoid compound.

10 28. Apparatus according to any of Claims 24 to 27, wherein said terpenoid compound comprises linalool.

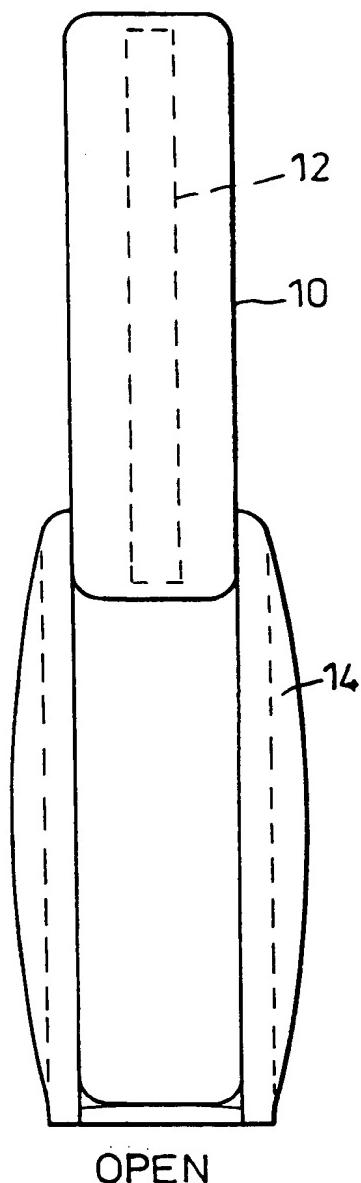
29. Apparatus according to any of Claims 24 to 28 wherein said emission element contains between 10 and 20 grams of linalool.

15 30. Apparatus according to any of Claims 24 to 29, wherein said emission element has a void volume of between 25% and 70% and an average pore size of between 10 and 100 microns.

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*Fig 1*



*Fig 2*

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REF: O3\_3/CHART 1  
VYON 4.75mm LINALOOL

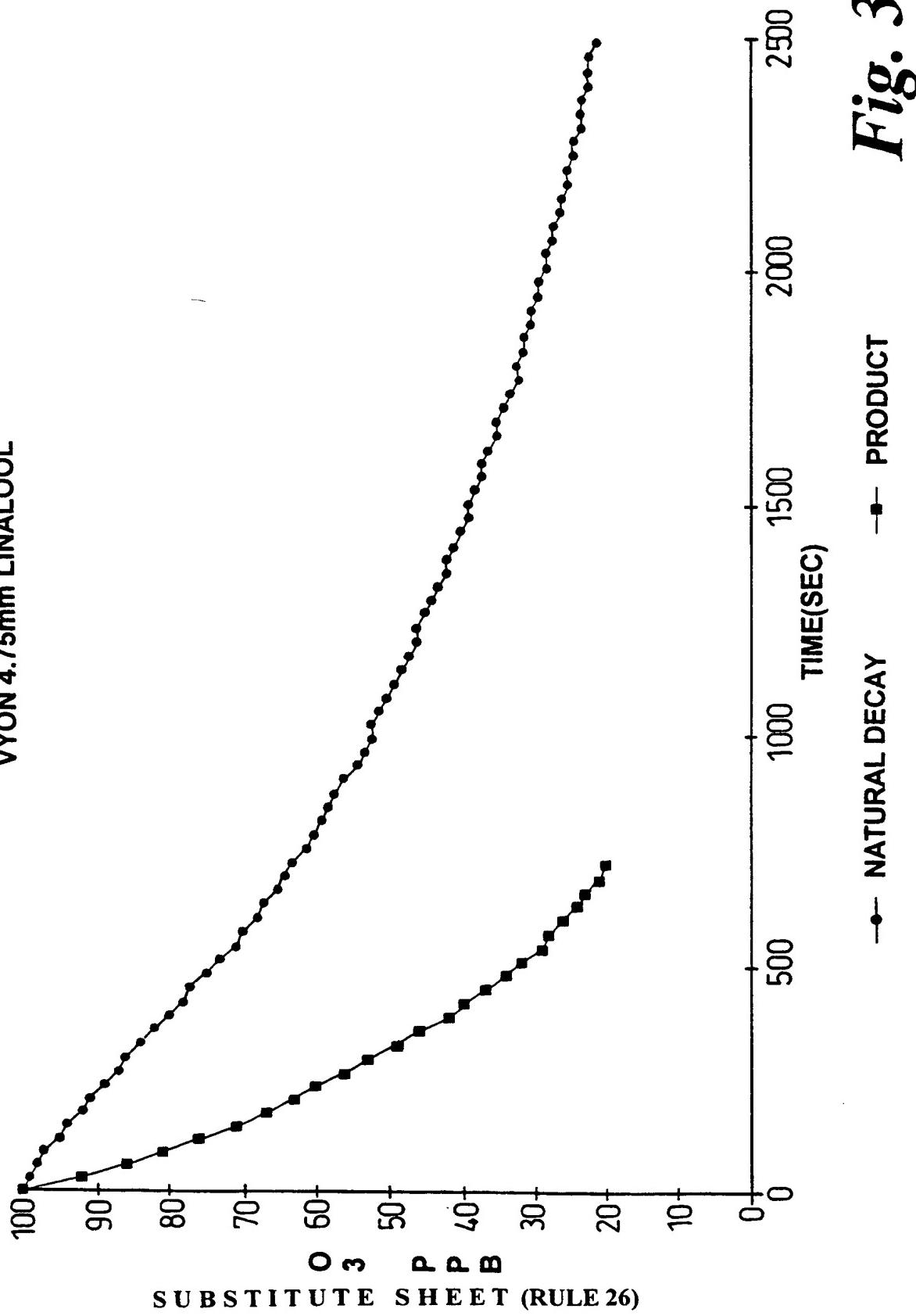
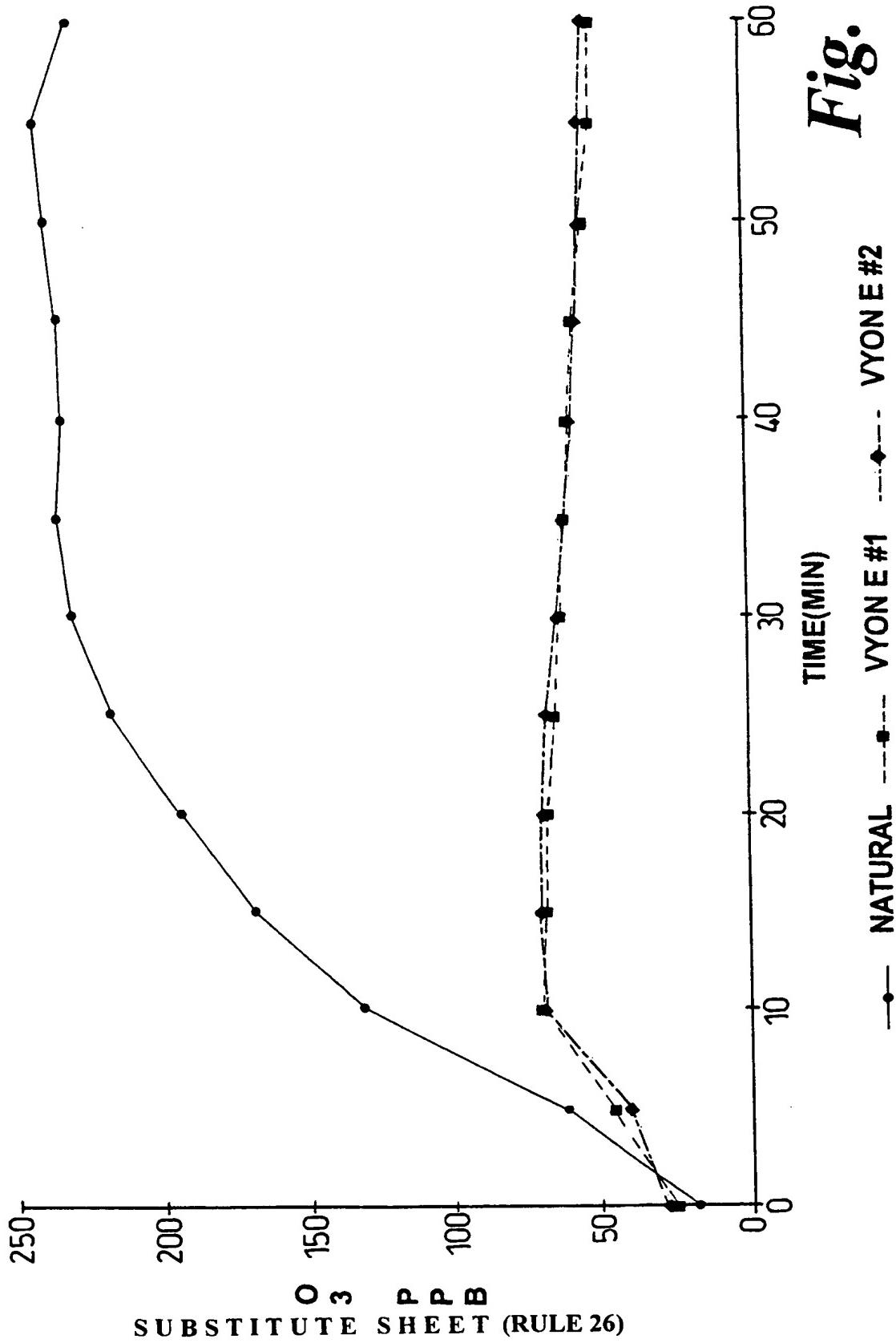


Fig. 3

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REF: O3\_9/CHART 2 18/1/99  
LINALOOL ON VYONE AFTER 72 HOURS



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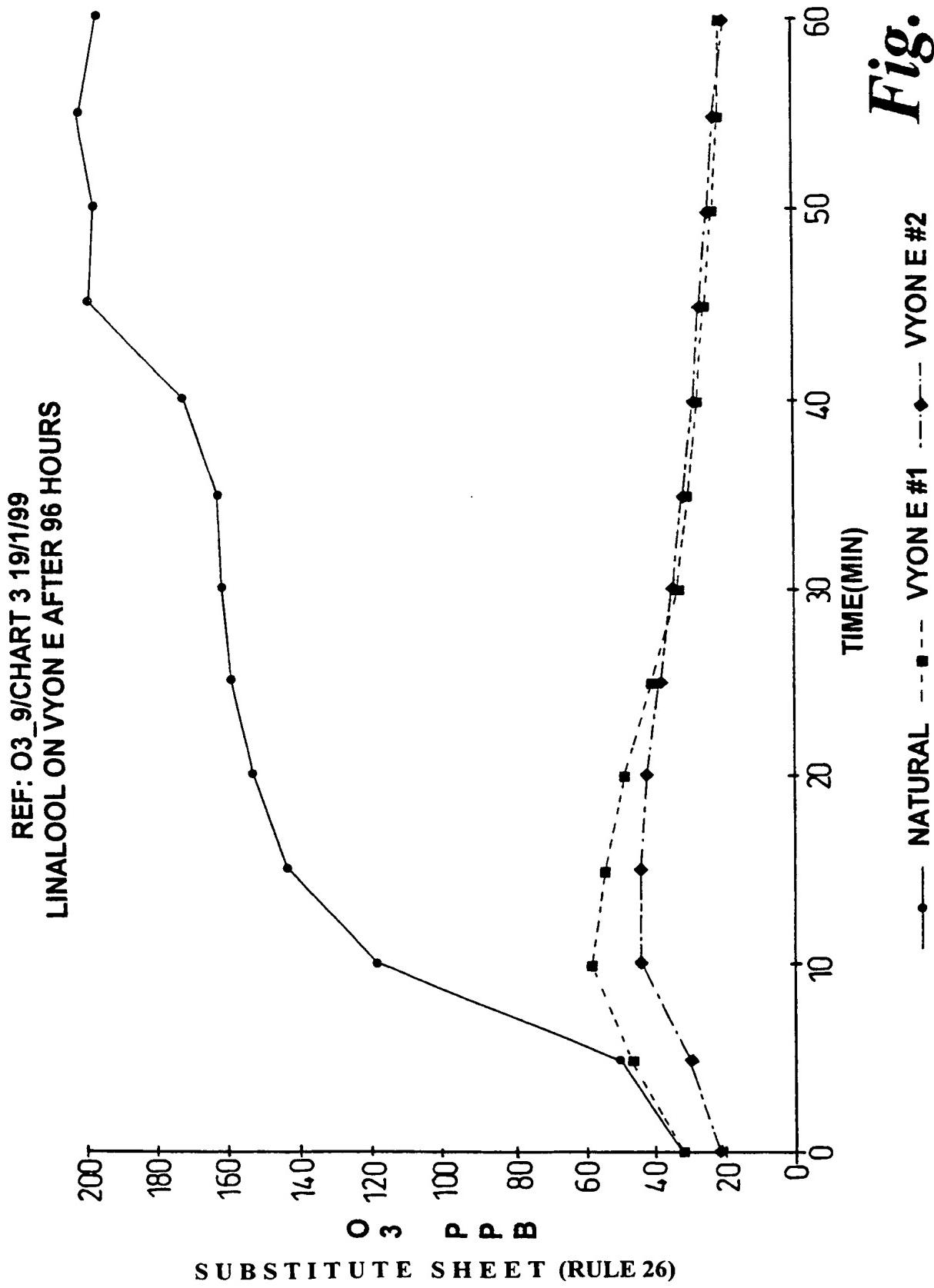


Fig. 4(b)

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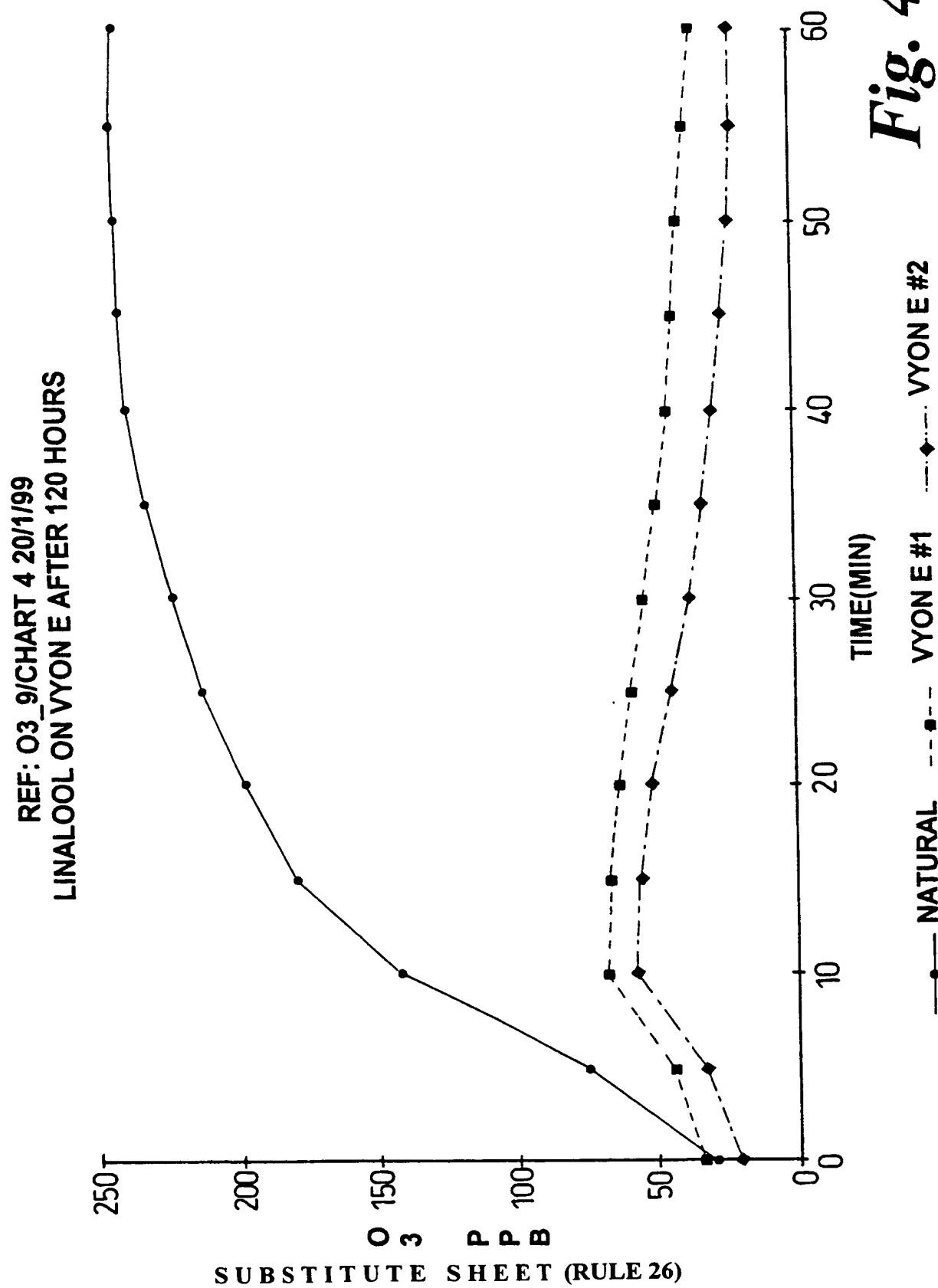


Fig. 4(c)

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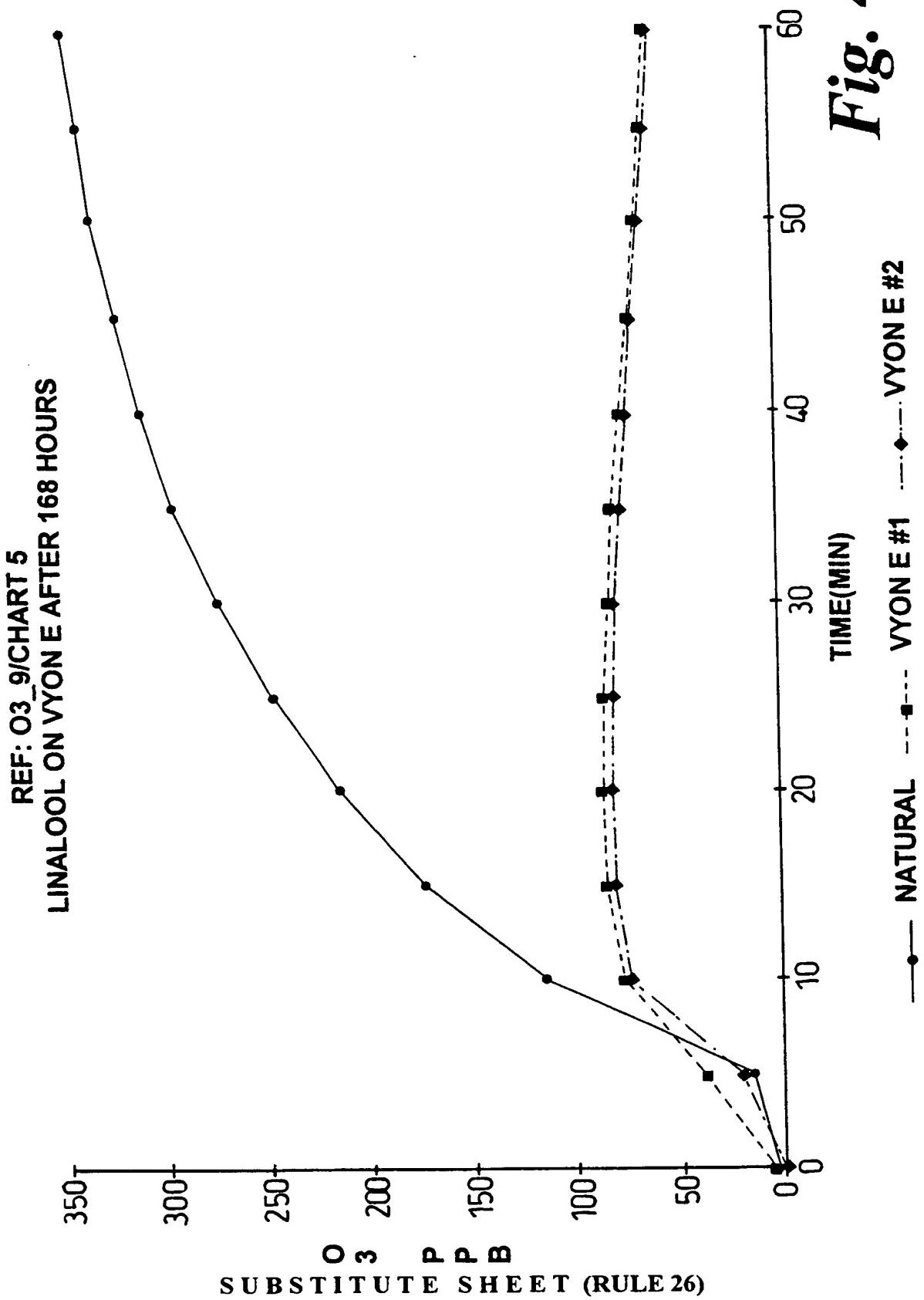


Fig. 4(d)

## INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/GB 00/02230

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B01D53/66

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 529 937 A (COLT INT HOLDINGS ;COLT INT LICENSING (GB); MOLE ALAN (GB)) 3 March 1993 (1993-03-03) the whole document ---	1,19
X	US 4 808 396 A (SHIBANAI ICHIROH ET AL) 28 February 1989 (1989-02-28)  column 1, line 37-55; figures 1,3 column 3, line 35 -column 4, line 14 column 4, line 48-61 column 6, line 4-11 ---	2,5,6, 19-21, 23,24,28
X	US 5 256 377 A (NAKAMARU SUSUMU ET AL) 26 October 1993 (1993-10-26) column 5, line 24-26; figures 8,13 column 5, line 54-62 column 6, line 25-35 ---	1,19,21, 23,24
	-/-	

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

8 September 2000

Date of mailing of the international search report

20/09/2000

Name and mailing address of the ISA  
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Authorized officer

Polesak, H

## INTERNATIONAL SEARCH REPORT

Intern. Application No.

PCT/GB 00/02230

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>DATABASE WPI            Section Ch, Week 198546            Derwent Publications Ltd., London, GB;            Class E17, AN 1985-287057            XP002147017            &amp; JP 60 197222 A (MATSUSHITA ELEC IND CO LTD), 5 October 1985 (1985-10-05)            abstract</p> <p>-----</p>	23
X	<p>DATABASE WPI            Section Ch, Week 199302            Derwent Publications Ltd., London, GB;            Class E36, AN 1993-012077            XP002147018            &amp; JP 04 338212 A (RICOH KK),            25 November 1992 (1992-11-25)            abstract</p> <p>-----</p>	1,8,24, 25

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Int'l. Appl. No.

PCT/GB 00/02230

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0529937	A	03-03-1993	AT 132243 T AU 2119392 A DE 69207118 D DE 69207118 T ES 2081573 T ZA 9206356 A	15-01-1996 25-02-1993 08-02-1996 04-07-1996 01-03-1996 25-03-1993
US 4808396	A	28-02-1989	JP 1606191 C JP 2030729 B JP 63059338 A DE 3728802 A FR 2603272 A GB 2196959 A, B	31-05-1991 09-07-1990 15-03-1988 03-03-1988 04-03-1988 11-05-1988
US 5256377	A	26-10-1993	JP 1742141 C JP 4033496 B JP 63270547 A JP 1058326 A JP 2605055 B CA 1331689 A DE 3814603 A FR 2614553 A GB 2210607 A, B	15-03-1993 03-06-1992 08-11-1988 06-03-1989 30-04-1997 30-08-1994 10-11-1988 04-11-1988 14-06-1989
JP 60197222	A	05-10-1985	JP 1625354 C JP 2050766 B	18-11-1991 05-11-1990
JP 4338212	A	25-11-1992	NONE	

## PATENT COOPERATION TREATY

10/009261

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

Date of mailing (day/month/year) 04 janvier 2002 (04.01.02)			
Applicant's or agent's file reference WN/LM/ATMOS1	<b>IMPORTANT NOTIFICATION</b>		
International application No. PCT/GB00/02230	International filing date (day/month/year) 08 juin 2000 (08.06.00)		

## 1. The following indications appeared on record concerning:

the applicant     the inventor     the agent     the common representative

Name and Address ATMOSPHERIC SOLUTIONS LIMITED Unit 23Y, Bond's Mill Estate Bristol Road, Stonehouse Gloucestershire GL10 3RF United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

the person     the name     the address     the nationality     the residence

Name and Address ATMOSPHERIC SOLUTIONS LIMITED Anglesey House 1 Worcester Road Malvern Worcestershire WR14 4NQ United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 3. Further observations, if necessary:

--

## 4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Ki-Nam HA  Telephone No.: (41-22) 338.83.38
---	---

## INTERNATIONAL COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION  
(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing:  14 December 2000 (14.12.00)	
International application No.:  PCT/GB00/02230	Applicant's or agent's file reference:  WN/LM/ATMOS1
International filing date:  08 June 2000 (08.06.00)	Priority date:  09 June 1999 (09.06.99)
Applicant:  MAXWELL, Stuart et al	

1. The designated Office is hereby notified of its election made:

in the demand filed with the International preliminary Examining Authority on:  
 \_\_\_\_\_  
 06 October 2000 (06.10.00)

in a notice effecting later election filed with the International Bureau on:  
 \_\_\_\_\_

2. The election  was  
 was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer: J. Zahra Telephone No.: (41-22) 338.83.38
---	---

## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

**NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT**

(PCT Administrative Instructions, Section 411)

To:

NEWELL, William, Joseph  
 Wynne-Jones, Lainé & James  
 22 Rodney Road  
 Cheltenham  
 Gloucestershire GL50 1JJ  
 ROYAUME-UNI

Date of mailing (day/month/year)  25 September 2000 (25.09.00)			
Applicant's or agent's file reference  WN/LM/ATMOS1	<b>IMPORTANT NOTIFICATION</b>		
International application No.  PCT/GB00/02230	International filing date (day/month/year)  08 June 2000 (08.06.00)		
International publication date (day/month/year)  Not yet published	Priority date (day/month/year)  09 June 1999 (09.06.99)		
Applicant  ATMOSPHERIC SOLUTIONS LIMITED et al			
<p>1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).</p> <p>2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.</p> <p>3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, <b>the attention of the applicant is directed to Rule 17.1(c)</b> which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.</p> <p>4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, <b>the attention of the applicant is directed to Rule 17.1(c)</b> which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.</p>			
<u>Priority date</u>  09 June 1999 (09.06.99)	<u>Priority application No.</u>  9913357.1	<u>Country or regional Office or PCT receiving Office</u>  GB	<u>Date of receipt of priority document</u>  25 July 2000 (25.07.00)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer  Marc Salzman  Telephone No. (41-22) 338.83.38	
--	---	---

## PATENT COOPERATION TREATY

PCT

**NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES**

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

NEWELL, William, Joseph  
 Wynne-Jones, Lainé & James  
 22 Rodney Road  
 Cheltenham  
 Gloucestershire GL50 1JJ  
 ROYAUME-UNI

<b>Date of mailing (day/month/year)</b> 14 December 2000 (14.12.00)	
<b>Applicant's or agent's file reference</b> WN/LM/ATMOS1	
<b>International application No.</b> PCT/GB00/02230	<b>International filing date (day/month/year)</b> 08 June 2000 (08.06.00)
<b>Priority date (day/month/year)</b> 09 June 1999 (09.06.99)	
<b>Applicant</b> ATMOSPHERIC SOLUTIONS LIMITED et al	

**IMPORTANT NOTICE**

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
**AG,AU,DZ,KP,KR,MZ,US**

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:  
**AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW**  
 The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 14 December 2000 (14.12.00) under No. WO 00/74820

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38



US



INVESTOR IN PEOPLE

Application No: GB 9913357.1  
 Claims searched: 1-30

Examiner: Dr Albert Mthupha  
 Date of search: 30 October 2000

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.R): A5G (GF, GV); B1W (WAX)

Int CI (Ed.7): A61L (9/015, 9/04, 9/12)

Other: ONLINE: EPODOC, JAPIO, WPI.

**Documents considered to be relevant:**

Category	Identity of document and relevant passage		Relevant to claims
US 5,256,377 = on 15/2	X	GB 2210607 A RICOH, see page 8-page 11, page 15 line 18-page 16 line 12, claims 1, 2, 5, 6, 10	1 at least.
US 4,808,396 = on 15/2	X	GB 2196959 A RICOH, see page 2 lines 7-59, page 3 lines 5-8, lines 18-19, lines 46-47, Example 1.	1, 19, 20, 21, 22, 23 at least.
US 4,735,626 = cited 12/10/01 (on 15/2)	X	GB 2164853 A RECKITT & COLMAN, see whole document.	1, 5, 6, 9, 11, 12, 19, 20, 21, 22, 23 at least.
	X	EP 0529937 A2 COLT, see page 2 column 2 lines 55-57, Claims 1 & 2.	1, 19, 20, 21, 22, 23.
	X	WPI Abstract AN 1991-225724 [25] & JP 3143526 A (SHIBAUCHI), see Abstract.	1 at least.
	X	WPI Abstract AN 1990-143765 [19] & JP 2090184 A (RICOH), see Abstract.	1, 19 at least.
	X	WPI Abstract AN 1990-033119 [05] & JP 1310366 A (CANON), see Abstract.	1, 19 at least.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.



Application No: GB 9913357.1  
Claims searched: 1-30

Examiner: Dr Albert Mthupha  
Date of search: 30 October 2000

Category	Identity of document and relevant passage	Relevant to claims
X	WPI Abstract AN 1987-231928 [25] & JP 62155927 A (RICOH), see Abstract.	1, 5, 19, 20, 21, 22, 23 at least.
X	WPI Abstract AN 1986-127578 [20] & JP 61064315 A (RICOH), see Abstract.	1, 19, 20, 21, 22, 23 at least.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.



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Your Reference: WN/LM/ATMOS.1  
Application No: GB 9913357.1

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31 December 2002

Dear Sirs

**Patents Act 1977: Examination Report under Section 18(3)**

Latest date for reply: 30 June 2003

I enclose two copies of my examination report and a copy of the new citation. Please note that the top up search has been delayed until the citations listed in the report have been overcome.

By the above date you should either file amendments to meet the objections in the enclosed report or make observations on them. If you do not, the application may be refused.

You should note that the normal unextended period allowed for complying fully with the requirements of the Act will end on 31 December 2003, that is 12 months after the date of this letter.

Yours faithfully

Robert Black  
Examiner

<sup>†</sup>Use of E-mail: Please note that e-mail should be used for correspondence only.





Your ref: WN/LM/ATMOS.1  
Application No: GB 9913357.1  
Applicant: Atmospheric Solutions Limited

Latest date for reply: **30 June 2003**

Examiner: Robert Black  
Tel: 01633 813788  
Date of report: 31 December 2002

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## Patents Act 1977 Examination Report under Section 18(3)

### Novelty (section 1(1)(a))

1. The invention as defined in claims 1, 5, 6, 8, 9, 12, 13, 16-21, 23, 24, 27 and 30 is not new because it has already been disclosed in the following documents:

- equivalents  
on ISR*
- ✓ GB 2210607 A (RICOH) especially page 8 lines 1-4, and page 11 lines 16-19, relevant to claims 1, 5, 19-21 and 23;
  - ✓ GB 2196959 A (RICOH) especially page 2 lines 7-59, and page 3 lines 5-8, relevant to claims 1, 5, 19-21 and 23;
  - ✓ GB 2164853 A (RECKITT) especially page 1 lines 13-17 and 50-56, page 1 line 64 to page 2 line 4, and page 2 lines 19-43, relevant to claims 1, 5, 9, 12, 13, 16-21, 24, 27 and 30;
  - ✓ EP 0529937 A2 (COLT) especially page 2 column 2 lines 55-57, and claims 1 and 2, relevant to claims 1, 5, 19-21 and 23;
  - ✓ JP 03-143526 A (SHIBAUCHI) especially WPI abstract 1991-225724, relevant to claims 1 and 5;
  - ✓ JP 02-090184 A (RICOH) especially WPI abstract 1990-143765, relevant to claims 1 and 24;
  - ✓ JP 01-310366 A (CANON) especially WPI abstract 1990-033119, relevant to claims 1, 5 and 8;
  - ✓ JP 62-155927 A (RICOH) especially WPI abstract 1987-231928, relevant to claims 1, 5, 9, 19-21, 23, 24 and 27;
  - ✓ JP 61-064315 A (RICOH) especially WPI abstract 1986-127578 and PAJ abstract, relevant to claims 1, 5, 19-21 and 23; and
  - on ISR* ✓ JP 60-197222 A (MATSUSHITA) especially WPI abstract 1985-287057, relevant to claim 23.

2. JP 60-197222 discloses the use of linalool to reduce the ozone concentration. Therefore claim 23 does not define an invention that is new. We regret that this document was not brought to your attention earlier, but it was cited against your equivalent PCT application.

3. The other citations (all except JP 60-197222) disclose apparatus that slowly releases terpenoids. Although GB 2164853 does not state that it is used to accelerate the decomposition of ozone, it is clearly suitable and will indeed accelerate the decomposition of any ozone that happens to be in the environment. The terpenoid vapour is released by evaporation. This means that the above citations anticipate claims 1 and 5.





Your ref: WN/LM/ATMOS.1  
Application No: GB 9913357.1

Date of Report: 31 December 2002  
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[ Examination Report contd. ]

4. GB 2210607, GB 2196959, GB 2164853, EP 0529937, JP 62-155927 and JP 61-064315 all disclose at least some of the specified essential oils (plant extracts) stipulated in claims 21 and 23, so claims 19-21 and 23 lack novelty.

5. In JP 01-310366 the terpenoids are released by evaporation from an emission element that can be enclosed within a housing or exposed to the ambient atmosphere, by opening and closing a cover. In GB 2164853 and JP 62-155927 the terpenoids are released from a porous synthetic polymer emission plate by evaporation, anticipating claims 5, 8 and 9.

6. In GB 2164853 90 wt. % particles are 50-350 micrometers. Before application of fragrance the support weighs 0.5-7 g, has an average pore size = 10-100 micrometers and 30-55% void volume. Hence claims 12, 13 and 16-18 lack novelty.

7. GB 2164853 and JP 62-155927 disclose containers that allow free circulation of vapour into the environment. The containers contain an emission element comprising an absorbent porous synthetic polymer impregnated with terpenoid. Therefore claims 24 and 27 are anticipated.

8. In GB 2164853 the polymer has a void volume = 25-70% and pore size = 10-100 micrometers, so claim 30 does not define a new invention.

**Inventive step (section 1(1)(b))**

9. The invention as defined in claims 6, 8, 10-13, 16-18, 22, 25, 28 and 30 is obvious in view of what has already been disclosed in the following documents:

GB 2210607 A	(RICOH) relevant to claims 6 and 22;
GB 2196959 A	(RICOH) relevant to claims 6 and 22;
GB 2164853 A	(RECKITT) relevant to claims 6, 8, 10-13, 16-18, 22, 25, 28 and 30;
EP 0529937 A2	(COLT) relevant to claims 6 and 22;
JP 04-338212 A	(RICOH) especially WPI abstract 1993-012077, relevant to claim 6, 8 and 25;
JP 02-090184 A	(RICOH) relevant to claims 6, 10-13, 16-18 and 30;
JP 01-310366 A	(CANON) relevant to claim 6, 8, 10-13, 16-18, 22 and 25;
JP 62-155927 A	(RICOH) relevant to claims 6, 8, 10-13, 16-18, 22 and 28;
JP 61-064315 A	(RICOH) relevant to claims 6, 22 and 28; and
JP 60-197222 A	(MATSUSHITA) especially WPI abstract 1985-287057, relevant to claim 28.

10. We regret that JP 04-338212 was not brought to your attention earlier, but it was





Your ref: WN/LM/ATMOS.1  
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[ Examination Report contd. ]

cited against your equivalent PCT application.

11. Even if the invention defined by claim 8 is new, it is not inventive in the light of GB 2164853, JP 04-338212, JP 01-310366 and JP 62-155927. JP 01-310366 does not explicitly disclose that the terpenoids are released by evaporation. This is explicitly disclosed in JP 62-155927. GB 2164853 implies and JP 04-338212 explicitly states that the ozone decomposing agent is released by evaporation from a container that can be opened or closed. There is no mention in JP 04-338212 what the ozone decomposing agent is, but it is quite clear from the other documents that it may be a terpenoid.

12. Even if the invention defined by claims 10-13, 16-18 and 30 is new, it lacks an inventive step in the light of GB 2164853, JP 02-090184, JP 01-310366 and JP 62-155927. In GB 2164853 and JP 62-155927 the emission element is made by moulding and/or sintering particles of (high density in GB 2164853) polyethylene. When claims 5 and 8 are anticipated or obvious, then claims 10-13, 16-18 and 30 lack an inventive step.

13. At least some of the terpenoids listed in GB 2210607, GB 2196959, GB 2164853, EP 0529937, JP 62-155927 and JP 61-064315 have a flash point greater than 60°C, and at least some of the terpenoids will evaporate at room temperatures. This destroys the inventive step of claims 6 and 22.

14. GB 2164853 and JP 62-155927 disclose containers that allow free circulation of vapour into the environment. The containers contain an emission element comprising an absorbent polymer impregnated with terpenoid. The containers can be opened and closed, so as to control evaporation of the terpenoid, as noted in JP 04-338212. In JP 62-155927, JP 61-064315 and JP 60-197222 the terpenoid is linalool, so claims 25 and 28 are obvious.

15. Please note that the top up search has been delayed until the citations listed above have been overcome and the scope of the invention becomes clearer.

**Scope (section 14(5)(a))**

16. The claims define the scope of the invention. The paragraph on page 8 lines 19-21 must be removed.

**Clarity (section 14(5)(b))**

17. The *said* synthetic polymer referred to in claim 10 is not mentioned in any of the claims 1-8 to which it is appendant. A polymer is mentioned in claim 9. Did you intend claim 10 to be appendant to claim 9 rather than claim 8?





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[ Examination Report contd. ]

**Support (section 14(5)(c))**

18. Page 6 lines 1-4 imply that claim 12 should be appendant to claim 11 rather than claims 9 or 10.

19. Claim 20 states that the terpenoid is an essential oil. There is no mention of that in the description, but only to the terpenoid being a plant extract on page 6 lines 19-22.

20. In claim 22 you state that the terpenoid has a flash point of at least 60°C whereas on page 7 lines 6-8 you state that the terpenoid has a flash point greater than 60°C.

**Registered Trade Marks**

21. Although it should preferably be avoided, if you wish to keep the references to the Registered Trade Mark "Vyon" on pages 5 and 9-13 of your specification, you should acknowledge that it is a Registered Trade Mark, possibly by using the abbreviation "(RTM)". If you do not insert an acknowledgment, I will do so in manuscript.

**Conflict with a corresponding European patent application**

22. This application appears to be similar to your European patent application published under No EP 1183089 A1, having the same priority date and designating GB. If patents granted on these two applications relate to the same invention, the Comptroller will in due course revoke the patent granted on the present application unless either you amend the present specification to remove the conflict or, before the date of grant of the present application under Section 25(1), you begin proceedings to surrender the European patent (UK). Of course if the GB designation is withdrawn before grant of the European patent, no action will be required under Section 73(2).

